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Publication date:
2014

Document Version
Publisher's PDF, also known as Version of record

WEFTA 2014

Characterization of process induced changes in matjes herring, using 2D gel electrophoresis

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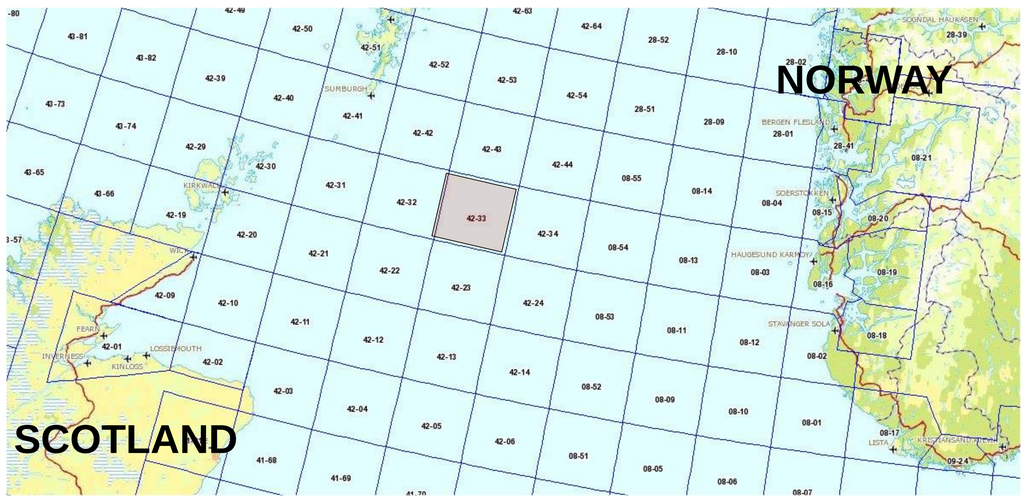
1. Introduction

Traditional matjes herring is a popular product, particularly in the Netherlands. It is produced from fatty North Sea herring (*Clupea harengus*) which should contain calanus in its intestinal tract in order to achieve the proper matjes herring quality.
In this study, the effect of salting procedure and the presence of calanus on the protein changes in fillet were investigated.

2. Material and Methods

North Sea herring was caught in the evening of June 13th, 2012 in the catching area 42-33 of the North Sea, and landed in the afternoon the day after, when the salting experiment started.



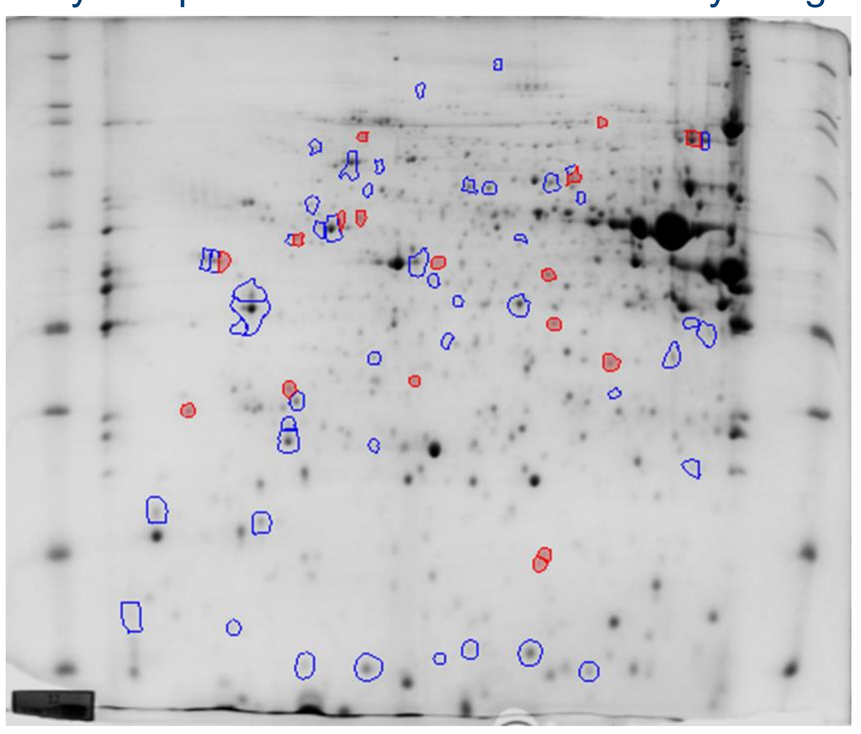
The average temperature in the on-board holding tanks was - 0,8°C, and the fat content (whole herring) was 20,5%.
The herring (**R**) was subjected to 2 different treatments: salted as gibbed (traditional matjes herring, **M**) and salted as gibbed and gutted (**G**). The average weight of the gibbed herring was 172 g (n = 20), and the gibbed and gutted, 153 g (n = 20). Herring (37,5 kg) and brine (7.5 L, 13 %) were kept in barrels for approximately 19 h, at an average temperature of 6°C. Fillet samples (n = 10) of raw material, as well as the two salted products (n = 2*10), were frozen at -80°C.

Gibbed and gutted (G, left) vs. Traditional Matjes (M, right)

After thawing, samples were taken from within the muscle (below the dorsal fin), homogenized in buffer and centrifuged (11.200 g, 20 min, 3°C). The supernatant was analyzed by 2D gel electrophoresis. The 30 gels were fixed and stained with Comassie blue. Gel images (CCD camera) were subjected to image analysis (Progenesis SameSpots, ver. 4.5, Non-linear Dynamics, Newcastle, UK), as described by Wulff et al (2012).

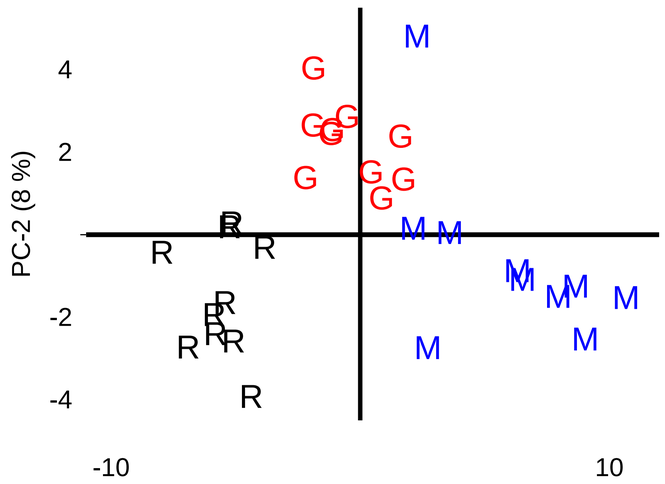
3. Results

2 D gel electrophoresis:
The image analysis showed 660 protein spots that could be quantitatively compared between all the 30 analysed gels.



During matjes production 64 spots changed significantly in volume compared to the raw material (all the marked spots).17 of these spots did also change in the gutted product compared to the raw material (the red spots).

Principal component analysis:



Using these 64 spots in a principal component analysis plot, grouped the samples from the raw herring and the two products along the first principal component, with the product that was salted as gibbed and gutted in between the raw herring and the traditional matjes.

4. Summary

The examination of the individual spot volumes and the principal component analysis indicated that some of the protein changes occurring during the traditional matjes production also were taking place when gutted fish were used. Thus indicating that not all the observed protein changes were dependent on intestinal or gut enzymes but were caused by inherent muscle enzymes.

References
Map souce (http://kart.fiskeridir.no/default.aspx?gui=1&lang=2)
Wulff, T., Jokumsen, A., Hojrup, P., and Jessen, F. (2012) Time-dependent changes in protein expression in rainbow trout muscle following hypoxia. Journal of Proteomics, 75, 2342-2351.